must be hemispherical; for if it were merely a band of light, all in the same plane, its phases must have varied like the ring of Saturn. This cap must also be comparatively thin, since the parts at a distance from its edge, which were therefore seen transversely, appeared dark in comparison to the circumference, where a greater quantity of luminous matter was seen by oblique vision. And it is to the same cause that the comparative brightness of the edges of the tail is ascribed by Dr. Herschel.

With respect to the production of some of the cometic phenomena, the author conjectures, that the light is of a phosphoric nature; that the luminous matter of the head, being expanded on one side by the action of the sun, occupies more space, and consequently occasions the planetary body to appear eccentric; that part of this matter, being greatly rarified, ascends in the cometic atmosphere till it occupies the surface of that medium on the side towards the sun, and forms the hemispherical part of the envelope. He next supposes a further attenuation and a decomposition of this matter, till its particles are sufficiently minute to receive a slow motion from the impulse of the solar beams, and consequently *gradually* to recede in a direction towards the region of the fixed stars, to the distance of 100,000,000 miles.

From the escape of such a quantity of light, and probably of other subtile elastic matters, in consequence of the comet's near approach to the sun, Dr. Herschel infers that a greater consolidation of the remaining solid matter of the comet takes place at the time of its perihelion passage. He further thinks it not unlikely that the matter they contain is derived from nebulæ, which they meet with in the extensive orbits they describe; that in their course they visit other suns beside our own; and at each successive approach to these various centres they undergo progressive condensation; from which we may conceive how other planetary bodies may begin to have existence.

On a gaseous Compound of carbonic Oxide and Chlorine. By John Davy, *Esq. Communicated by Sir* Humphry Davy, *Knt. LL.D. Sec. R.S.* Read February 6, 1812. [*Phil. Trans.* 1812, *p.* 144.]

Although it has been asserted by Messrs. Gay-Lussac and Thenard, and also by Mr. Murray, that carbonic acid and chlorine have no action upon each other, Mr. J. Davy has observed the contrary to be the case. A mixture of equal parts of these gases, previously dried over mercury, being exposed to bright sunshine for about one quarter of an hour, lost all colour of the chloric gas, and were found condensed into half their former volume. The smell of this gas was more suffocating than that of chlorine. It occasioned a very painful sensation in the eyes; it reddened litmus paper; it combined with ammonia, forming a salt perfectly neutral and dry, but deliquescent by attracting moisture from the atmosphere. This salt was decomposed by sulphuric, nitric, and phosphoric acids, and also by liquid muriatic

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acid; but sublimed unaltered in carbonic, sulphureous, and muriatic acid gases.

In those instances where the salt was decomposed, the products were carbonic and muriatic acid gases. It is remarkable, that in the formation of this ammoniacal salt, the new gas combines with as much as four times its bulk of ammoniacal gas.

Tin, zinc, antimony, or arsenic, heated in this gas, combine with the chlorine, forming the usual compounds, and extricate carbonic oxide. The decomposition thus effected is completed in a few minutes, but without explosion or ignition. Nor was even the action of potassium violent, although the decomposition was more complete; since the carbonic oxide itself was decomposed, and carbon deposited. When the white oxide of zinc was employed instead of the metal, the gas that remained was found to be carbonic acid.

Sulphur or phosphorus might be sublimed in this gas without effecting any change upon it. Neither did hydrogen or oxygen singly produce any effect by means of the electric spark; but when both were mixed in due proportion of two parts hydrogen with one oxygen to two of the gas, an explosion took place, with the formation of muriatic acid and carbonic acid.

The power of this gas as an acid is such as to decompound dry subcarbonate of ammonia; and its power of saturation is so remarkable, that the quantity of ammonia, which was not saturated by two measures of carbonic acid, became fully saturated by only one measure of the new gas, which had extricated those two measures.

For the formation of this gas, it is absolutely necessary that its constituents should be in a state of perfect dryness, otherwise it will be mixed with carbonic acid and muriatic acid, in proportion to the quantity of moisture present; for if water be admitted to it, the whole is decomposed.

If they be mixed in a receiver previously exhausted, the direct light of the sun is not necessary; daylight alone is sufficient to unite them in less than twelve hours. But when they are mixed over mercury, then it is requisite to expose them immediately to bright sunshine; for otherwise the chlorine is absorbed by the mercury, and carbonic oxide alone remains.

The author also has endeavoured to unite these gases in an earthenware tube heated to redness, but without success.

The specific gravity of the gas has not been directly measured, but is inferred from the diminished bulk which it has been observed to occupy, and the known weights of the two gases which compose it. From these data, 100 cubic inches of gas are estimated to weigh 105·97 grains.

The relative affinities of chlorine for carbonic oxide or for hydrogen, and of carbonic oxide for chlorine or for oxygen, appeared to the author to be very nicely poised.

Hydrogen does not decompose the new gas, neither does carbonic oxide decompose muriatic gas; and further, if equal parts of chlorine, of hydrogen, and of carbonic oxide, be mixed and exposed to light, the chlorine is found to divide itself equally between the other two.

So also with respect to the relative affinities of carbonic oxide for chlorine or for oxygen. The new gas is not decomposed by oxygen, neither is carbonic oxide altered by admixture with any proportion of chlorine that has been tried.

A Narrative of the Eruption of a Volcano in the Sea off the Island of St. Michael. By S. Tillard, *Esq. Captain in the Royal Navy. Communicated by the Right Hon. Sir* Joseph Banks, *Bart. K.B. P.R.S.* Read February 6, 1812. [*Phil. Trans.* 1812, *p.* 152.]

The eruption here described by Capt. Tillard was first observed by him on the 12th of June, 1811, having burst forth only two days before. It had been preceded by another eruption in the month of January, about three miles distant. Having come to anchor on the 13th in the road of Porta del Garda, Capt. Tillard set off on the following morning with some other gentlemen, for the purpose of witnessing the phenomena from the adjacent cliffs of St. Michael. The place of the eruption was scarcely a mile from the base of the cliff, which was nearly perpendicular, and about 400 feet high.

In the most quiescent state of the volcano, there appeared a circular body of smoke over the surface of the water, in continual rotatory motion, extending itself to leeward; but suddenly a column of very black ashes and cinders would shoot up, in the form of a spire, inclined from ten to twenty degrees from the perpendicular; and, again, a second, third, and fourth column, each overtopping the preceding, till the last appeared more above the level of the eye than the sea was below it.

When the first impetus that raised the column ceased, the smoke was seen to break into various fanciful forms; some ascending by their proper levity, others carried downwards by the particles of falling ashes, so as to give the appearance of pendent plumes of black and white.

These bursts were always accompanied by vivid flashes of lightning in the densest part, and followed by a succession of waterspouts that appeared drawn up by the masses of smoke as they rolled away before the wind.

The part of the sea where the volcano was situated was known to be full thirty fathoms deep; but in the course of the time that Capt. Tillard and his friends were watching it, a ridge was seen to project above the surface of the water; and before they quitted the cliff, which was in about three hours, a complete crater was formed, apparently 400 or 500 feet in width, and elevated on the leeward side not less than twenty feet in height.

The great eruptions were generally attended with sounds like the firing of cannon or musquetry, and often with slight shocks of earthquake.

On the next day the volcano continued to emit clouds of black smoke and ashes, but was comparatively tranquil.